

31 PCT/1

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### User interface of a machine tool

The present invention relates to a user interface of a machine tool.

It is the underlying object of the present invention to improve the clarity of a user interface of this type.

This object is achieved in accordance with the invention by a user interface comprising a display which is divided into at least two regions with a main menu, in particular, a menu bar, which is permanently displayed in the first display region for selecting different main modes of the user interface, each with a main window which is opened in the second display region in accordance with the main mode selected in the main menu, wherein at least one of the main windows comprises a permanently displayed submenu for selecting different submodes, and a subwindow which is opened in accordance with the selected submode, and comprising an input unit for selecting the individual modes and for processing the input fields provided in a window, wherein the display permanently displays which one of the main modes is selected.

The inventive user interface is configured in an activity-oriented manner, i.e. information and functions are displayed on the user interface in such a manner that the activity of the user is displayed thereon. It shows the information or functions which are required to fulfil the current task. This information is displayed oriented on the usual workflow. The user obtains access to the essential functionality of the machine via so-called main modes (main activities) which are permanently displayed on the display. The submodes (side activities) are oriented on the workflow (working process) of the respective main mode.

Main modes are e.g. production, setting, programming, technology, maintenance and start-up, diagnosis and help. For instance, in a pipe bending machine, the submodes of the main mode "setting" are e.g. functional modules, individual functions and

preparations. The submodes of the main mode “programming” are bending part, pipe geometry, pipe data, tools, process flow and corrections. The submodes of the main mode “technology” are e.g. pipe data, tool catalogue and resqueezing. The submodes of the main mode “maintenance and start-up” are e.g. maintenance overview, maintenance plan, machine parameters and machine options. The submodes of the main mode “diagnosis” are e.g. upcoming messages, message history, E/A monitor and software versions, and the submodes of the main mode “help” are e.g. machine view, bending technology, manual and spare part list.

The essential advantage of the inventive user interface is that the user can always see in which main mode and submode he/she is at the moment due to the permanently displayed main menu with emphasized selected main mode, and due to the permanently displayed submenu. Moreover, the user can change from each window of a main mode to a different main window through selecting a main mode in the permanently displayed main menu.

The selected main mode may be marked e.g. be emphasized in a graphical or different manner in the main menu.

If required, a subwindow may comprise a permanently displayed sub-submenu for selecting different sub-submodes of the selected submode, and a sub-subwindow which is opened in correspondence with the selected sub-submode.

In advantageous embodiments of the invention, at least one of the windows has a navigation menu for selecting different navigation modes each graphically representing a region of the machine tool, wherein a navigation window is opened within the associated window in accordance with the selected navigation mode. The navigation menu, being a display-related access, is based on a realistic illustration of the physical machine or machine part regions, and is used e.g. to select machine regions to be subjected to certain activities or settings. The realistic illustration permits direct transfer between the actual machine and the software, which permits efficient operation with little learning effort. Even special options, which may be contained due to customer-specific adjustments of the machine, can be selected via lists using the display-related access.

The subwindow, sub-subwindow or navigation window, which was opened before switching-over to a different main mode, is preferably opened when returning into the original main mode. If the user changes the main mode while e.g. a subwindow is opened, this subwindow will still be open when he/she returns into the original main mode with the result that the user can switch-over to different main modes even when the subwindow is opened. In this case, the user can switch e.g. from each position over to the main mode "diagnosis" to analyse possibly issued alarm or warning messages to switch-over to the main mode "help" without having to close the windows concerned. In this manner, the user can even program a new part while automatic production is running. He/she can thereby change between the main modes "production" and "programming" without causing any interaction between them.

In preferred embodiments of the invention, at least one of the windows comprises at least one activity button, which is associated with an activity button window, for processing input fields provided therein. The activity button windows have the advantage that the action initiated through activation of the activity button must either be deliberately terminated by the operator or be continued to the end. When the activity button window is closed, the program returns to the window in which the activity button window was opened. The activity buttons can directly perform functions or start a corresponding subdialogue.

Switching-over to a different window of the same main mode is advantageously blocked when an activity button window is opened. Thus, when an activity button window is opened, no other windows of the main mode associated with the activity button window can be processed.

The sequence of the individual submodes, sub-submodes and navigation modes within one main mode is preferably oriented on the workflow of the machine tool. If a submenu is disposed in a horizontal direction as a tab, the access to the submode to be executed at first is shown on the tab on the very left. With the user progressing through the workflow, the corresponding tabs are further to the right hand side.

At least the submenus and/or the sub-submenus are preferably designed as tab menu bars.

In preferred embodiments of the invention, the display and the input unit are formed by a touch screen and navigation through the user interface is effected through touch screen operation. To ensure failure-free operation, navigation using keyboard and mouse is optionally possible.

Further advantages of the invention can be extracted from the description and the drawing. The features mentioned above and below can be used individually or collectively in arbitrary combination. The embodiments shown and described are not to be understood as exhaustive enumeration but have exemplary character for describing the invention.

Figs. 1 through 6 show different displays of the inventive user interface.

Fig. 1 shows the display 1 of a user interface of a machine tool. The display 1 is divided into a right-hand display region 2 which displays a main menu 3 for selecting e.g. seven different main modes 3<sub>1</sub> to 3<sub>7</sub> of the user interface, and a left-hand display region 4 in which different main windows 5<sub>1</sub> to 5<sub>7</sub> are opened one at a time depending on the main mode selected in the main menu 3. The main menu 3 designed as vertical menu bar is permanently displayed and comprises different main activities of the machine tool, in particular, production, setting, programming, maintenance/start-up/diagnosis, help etc., as main modes 3<sub>1</sub> to 3<sub>7</sub> to be selected.

In Fig. 1, the main window 5<sub>1</sub> associated with the main mode 3<sub>1</sub> is opened which is a pure display window and therefore has no submenu or data fields to be selected or filled in by the operator.

In Fig. 2, the main window 5<sub>2</sub> associated with the main mode 3<sub>2</sub> is opened. At the top of this window, a submenu 6 having the form of a horizontal tab menu bar is permanently displayed for selecting e.g. four different submodes 6<sub>1</sub> to 6<sub>4</sub> of the selected main mode 3<sub>2</sub>, and below a subwindow 7<sub>1</sub> to 7<sub>4</sub> each of which are opened in dependence on the selected submode. In the example shown, the submode 6<sub>1</sub> is

selected and the associated subwindow 7<sub>1</sub> is therefore opened. If the user changes the main mode while the subwindow 7<sub>1</sub> is opened, this subwindow will still be open when he/she returns into the original main mode 3<sub>2</sub>.

In Fig. 3 both the main window 5<sub>2</sub> which is associated with the main mode 3<sub>2</sub> and its subwindow 7<sub>3</sub> which is associated with the submode 6<sub>3</sub> are opened. The subwindow 7<sub>3</sub> permanently shows a sub-submenu 8 in the form of a horizontal tab menu bar for selecting e.g. three different sub-submodes 8<sub>1</sub> through 8<sub>3</sub> of the selected submode 6<sub>3</sub> and below one sub-subwindow 9<sub>1</sub> to 9<sub>3</sub> each of which are opened in dependence on the selected sub-submode. In the example shown, the sub-submode 8<sub>1</sub> is selected and hence the associated sub-subwindow 9<sub>1</sub> is opened.

In Fig. 4 both the main window 5<sub>2</sub> which is associated with the main mode 3<sub>2</sub> and its subwindow 7<sub>4</sub> which is associated with the submode 6<sub>4</sub> are opened. The permanent display on the left in the subwindow 7<sub>4</sub> shows a navigation menu 10 in the form of a vertical menu bar for selecting e.g. four different navigation modes 10<sub>1</sub> to 10<sub>4</sub> of the selected submode 6<sub>4</sub> and to the right thereof one navigation window 11<sub>1</sub> to 11<sub>4</sub> which is opened in dependence on the selected navigation mode. In the embodiment shown, the navigation mode 10<sub>1</sub> is selected and therefore, the associated navigation window 11<sub>1</sub> is opened which comprises at the top a navigation submenu 12 in the form of a horizontal tab menu bar for selecting e.g. four different navigation submodes 12<sub>1</sub> to 12<sub>3</sub> and below one navigation subwindow each of which is opened in dependence on the selected navigation submode. In the embodiment shown, the navigation submode 12<sub>1</sub> is selected and the navigation subwindow 13<sub>1</sub> is correspondingly opened. The individual navigation modes 10<sub>1</sub> through 10<sub>4</sub> each represent a region of the machine tool graphically.

The main windows 5<sub>1</sub> through 5<sub>7</sub>, the subwindows 7<sub>1</sub> to 7<sub>4</sub>, the sub-subwindows 9<sub>1</sub> to 9<sub>3</sub>, the navigation windows 11<sub>1</sub> to 11<sub>4</sub> and the navigation subwindows have input fields 14 which can be filled in by the operator unless they are pure display windows. As is shown in Fig. 3, activity buttons 15<sub>1</sub> to 15<sub>4</sub> are provided on the lower edge of the sub-subwindow 9<sub>1</sub>, which support processing of the input fields 14 provided in the sub-subwindow 9<sub>1</sub>. The activity buttons may e.g. be "create new data", "process existing data", "delete existing data", "import data".

Each activity button is associated with an activity button window. The activity button window 16<sub>1</sub> of the activity button 15<sub>1</sub>, which is exemplarily shown in Fig. 5, has further activity buttons 17<sub>1</sub> to 17<sub>3</sub> in addition to the input fields 14, which have the functions "assistant", "take over the input data" and "terminate".

Upon activation of the assistant, i.e. of the activity button 17<sub>1</sub>, the assistant window 18<sub>1</sub> shown in Fig. 6 opens, which comprises, in addition to input fields 14, further activity buttons 19<sub>1</sub> to 19<sub>3</sub> with the functions "assistant forward", "assistant backward" and "terminate". The function "assistant forward" permits activation of a further assistant field and the function "assistant backward" permits activation of the respectively preceding assistant window. The assistant thereby permits navigation of the user when entering the required data.

When the activity button window 16<sub>1</sub>, 18<sub>1</sub> is opened, change to a different window of the same main mode is blocked, and therefore no other windows of the main mode associated with the activity button window can be processed. Closing of the activity button window is followed by return to the window, in which the activity button window was opened. The activity button windows 16<sub>1</sub>, 18<sub>1</sub> have the advantage that the action initiated through activation of an activity button must either be deliberately terminated by the operator or continued to the end.

In addition to the display regions 2, 4 shown in the drawing, further display regions may be provided, e.g. an information window which displays e.g. user name, warnings etc.